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**Working Papers in Management**

**Birkbeck, Department of Management**

**BWPMA 1303**

# TESTING THE FOREIGN AID-LED GROWTH HYPOTHESIS IN WEST AFRICA

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April 2013

**ISSN 2052 – 0581**

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# TESTING THE FOREIGN AID-LED GROWTH HYPOTHESIS IN WEST AFRICA

## Abstract

*This paper assesses the foreign aid-led growth hypothesis in a panel of West African countries using panel cointegration techniques ( Pendroni Residual Cointegration Test, Error Correction Model, Johansen Fisher Panel Cointegration Test) and then on a country-by-country basis using time series cointegration techniques (Engle-Granger test, Error Correction Model , Johansen system cointegration test). The panel cointegration results indicate a long run relationship between aid and growth in the whole panel. For the individual countries, at least one test showed evidence of this long run relationship. Granger causality tests were done for the whole panel and then for each country individually to establish direction of causality between foreign aid and economic growth. There is evidence of unidirectional causality from foreign aid to economic growth, from economic growth to foreign aid and there are cases where both variables are independent. A simplified variation of the Chenery and Strout Two-Gap Model was estimated to test the impact of foreign aid and selected explanatory variables on economic growth in countries where aid was found to granger cause growth and this impact varied from country to country.*

**Keywords:** *Foreign Aid, Growth, Error Correction Model, Johansen Panel Cointegration Test, Engle-Granger test, Granger causality*

**JEL Classification Numbers:** F35, C13, O40

## 1. INTRODUCTION

“In recognition of the special importance of the role which can be fulfilled only by official development assistance, a major part of financial resource transfers to the developing countries should be provided in the form of official development assistance. Each economically advanced country will progressively increase its official development assistance to the developing countries and will exert its best efforts to reach a minimum net amount of 0.7 per cent of its gross national product at market prices by the middle of the Decade”, *International Development Strategy for the Second United Nations Development Decade, UN General Assembly Resolution 2626 (XXV), October 24, 1970, paragraph 43.*

This quote reiterates the fact that Official Development Assistance (hereafter ‘foreign aid’) programs aimed at developing countries started even before there was compelling empirical evidence that they could alleviate poverty and promote economic growth. In 2003, Africa received 46% of total foreign aid flows (OECD, 2003). In 2007, the top ten donors- United States, Japan, France, United Kingdom, Germany, Netherlands, Sweden, Italy, Norway, Denmark- and other donors from the international community committed to double the amount of foreign aid given to Sub-Saharan African countries to help them meet the Millennium Development Goals by 2010, (IMF, 2007). Most donors aim at promoting poverty reduction, strengthening education, health and agricultural sectors, good governance and ensuring self-sustaining economic growth in the recipient economies, (Lensink and White, 1997).

In spite of these broad objectives of foreign aid, economic growth has always been the key benchmark used to evaluate the effectiveness of aid, especially as greater aid inflows are expected to lead to faster growth. However, for most Sub-Saharan African countries, it has emerged that the more foreign aid they receive, the more aid dependent they become. Taking Sierra Leone as an example, in 2002, foreign aid inflows accounted for 47% of its GDP (OECD, 2003).

Against this background, several studies have investigated the empirical relationship between aid and growth and the effectiveness of foreign aid in achieving the main objectives of donor aid. Does foreign aid raise economic growth? The answer is not unanimous. There are studies in the empirical literature that maintain that there generally exists a positive relationship between aid and economic growth. Among such studies are Hadjimichael et al. (1995), Reddy and Minoiu (2006) and Durbarray, Gemmell and Greenaway (1998). Some studies on the other hand have found that the positive relationship between aid and economic growth is not general but dependent on a number of factors. The main factors highlighted in the literature include the quality of policies (Burnside and Dollar, 1997); level of corruption (Svensson, 2000); type of political regimes (Boone, 1995) and absorptive capacity of the recipient economy (Collier and Hoeffler, 2004).

On the other hand of the spectrum, there are studies with results indicating that foreign aid is detrimental to economic growth of developing countries. Most of these studies including Griffin and Enos (1970); Boone (1994); Easterly (1999), Rajan and Subramanian (2005) and Harford and Klein

(2005) have shown that in some cases, aid promotes corruption, damage institutions and even lead to 'Dutch Disease'.

This evidence of conflicting findings in respect of the impact of aid on growth is also evident in studies using complete African data sets. Whilst studies such as Levy (1988), Bethune-Cookman and Dasha Chatrnas (2010) and Lloyd et al. (2001) report the growth enhancing impact of aid on economic growth, Elbadawi (1999), Quartey's (2005) and M'Amanja and Morrissey (2006) conclude that aid has a negative impact on long run growth.

In theory, savings, fiscal and foreign exchange constraints limit the growth potential of many developing economies. Models like Harrod (1939) and Domar (1946) which was later extended by Chenery and Strout (1966) in their two-gap model predict that aid can be used to close the savings, fiscal and foreign exchange gaps faced by countries thus leading to economic growth. Using this as motivation, this paper would test the foreign –aid led growth hypothesis in West Africa.

Net Official Aid received as a percentage of government expenditure statistics reveal that 31% of government expenditures in Cote d'Ivoire are made up of aid. This increases worryingly to 38% for Ghana, 73% for Gambia, 80% for Senegal, 91% for Guinea, 150% for Sierra Leone, 221% for Guinea Bissau and 771% for Liberia, (OECD 2008). With all these large percentages of aid per GDP, the Economic Community of West African States released a statement revealing that West Africa achieved an economic growth rate of 6.9 % in 2012, more than double the global rate. Of the 15 ECOWAS countries, Sierra Leone recorded a growth rate of 18.3 % compared to forecasted rate of 8 per cent for Burkina Faso, Côte d'Ivoire, Ghana, Liberia and Niger. Clearly there is a need to assess the impact of aid on economic growth in these countries. The World's poorest continent is getting richer but aid flows continue to increase.

To our knowledge, there is no published study investigating the foreign aid-led growth hypothesis using a complete West African dataset, up to date time series statistics and current econometric methods. This study on a region that is growing rapidly and whose study within this foreign aid- led growth discussion has been omitted would complement the few existing empirical works especially those that have included a few African countries in their dataset within this debate. We aim to show the direction of causality between aid and growth in these countries so that policy makers can formulate policies incorporating these causal directions thus ensuring greater desired impact.

Using both time series and panel cointegration techniques, we reveal a long run relationship between foreign aid and economic growth that in most of the West African countries. On the issue of causality however, the aid was found to granger cause economic growth in Guinea, Mali and Senegal. A simplified variant of the Two-Gap model is used to estimate the impact of aid and other economic variables on the economic growth of countries where aid has been shown to granger cause economic growth. Aid has a significant positive impact on economic growth in Mali and Senegal whilst surprisingly a negative impact was found in Guinea. Productivity of the labour force and initial level of development proved to be highly significant in determining economic growth in these three countries.

The next section reviews some of the theoretical and empirical literature surrounding the foreign aid-led growth debate. The methodology used would be explained in section three and empirical results would be presented in section four. Concluding remarks and policy recommendations would follow.

## 2.1 THEORETICAL LITERATURE REVIEW

Theoretically, savings, fiscal and foreign exchange constraints limit the growth potential of many developing economies. The perception is that if foreign aid can close the gap caused by these constraints, it must have a positive correlation with investment and growth (Bacha, 1990; Hjertholm et al, 2000).

Pieces of research that test the hypothesis foreign aid -led growth hypothesis have their conceptual underpinnings on early growth models. Foreign aid theories employed today are variants of the different growth and development theories. Classical economists like Adam Smith, Alfred Marshall and David Ricardo stressed that capital is an important determinant of growth and development. Joseph Schumpeter (1954) goes further and argues that foreign aid only leads to growth when combined with the transfer of entrepreneurship and new skills thereby enhancing the absorptive capacity of the recipient economy. Another theory that has influenced the aid effectiveness literature is the Investment Saving-Liquidity preference Money supply (IS-LM) macroeconomic theory. In the IS-LM framework, aid effectiveness is evaluated by assessing short run and long run changes in output as a result of the amount aid entering the country.

Even though neoclassical growth models are the leading theoretical models in development economics, the archetype model used in estimating the effect of foreign aid on growth is the model put forward by Harrod (1939) and Domar (1946). The Harrod-Domar model shows that the main barrier to growth is the savings constraint. McKinnon (1964), Chenery and Strout (1966), Findlay (1973), and others extended the Harrod- Domar growth model to show that foreign capital can increase the growth by increasing the availability of capital for production, where the capital-output ratio is held constant. The most famous extension is the 'Two-Gap model' of Chenery and Strout who built on earlier work by other development economists, such as Arthur Lewis (1954) and Walt Rostow (1960). These economists stressed that an aid-financed increase in investment would promote a "take off into self-sustained growth." Chenery and Strout (1966) illustrated how aid fills the savings and fiscal and foreign exchange gaps through capital accumulation and investment. Bacha (1990) extended the two-gap model into 'Three- Gap model' to include the government's fiscal position as another possible gap. Todaro and Smith (2004) claimed that most Two-Gap models assume that the savings gap and the foreign-exchange gap are unequal and independent therefore it is assumed that at any point given in time at least one of the gaps is binding and foreign aid fills that gap, Easterly (2003), Mehmet, (2008).

These models have however received some criticism in the available literature. Many writers point out that they are over-simplified. In the Harrod-Domar model, production technology and the capital-labour ratio are fixed thus capital accumulation is essential for growth. On the other hand, in the Solow-Swan model, the capital-labour ratio changes with technology innovation, which is the source of growth. Mehmet (2008) pointed out that another problem with the two-gap model is the old fashioned Leontief-style production function. More recent models of aid consider Solow-type growth

models with Cobb- Douglas production function. The Solow model, however, does not offer a stable, linear relationship between aid and growth.

An alternative to the neoclassical growth models, endogenous growth models take into account intermediate goods, social, institutional and government policies, and other factors as well as more traditional inputs, Barro (1990), Hall and Jones (1999). This comes with advances in growth theory have come to show that the growth process relies on a complex set of interdependent factors. Advanced growth theories have found that various factors besides physical capital accumulation affect the growth process. This is a move towards an eclectic theory of aid. Modern studies are based on the neoclassical growth model but include various explanatory variables dependent on economic theory and data availability.

However, the empirical literature on aid effectiveness in terms of its impact on long-run economic growth is not unanimous. There are many alternative views on the effectiveness of aid. The key views include: (a) aid has a positive impact on economic growth but is conditional on a number of factors (b) aid has a negative impact on economic growth because of a number of issues (c) aid has decreasing returns. This literature review would now evaluate studies aligned with each of these views.

## **2.2 EMPIRICAL LITERATURE REVIEW**

There are studies in the empirical literature that claim that there generally exists a positive relationship between aid and economic growth. Promoters of this view believe that aid finances investment, normally in foreign currency, can directly complement domestic resources, and fill the savings-investment gap and, the foreign exchange gap. Subsets of researchers who share this aid-led growth belief claim that the effectiveness of aid is conditional on the economic policies, quality of institutions, and political regime.

Hadjimichael et al. (1995) using a sample of forty-one countries find evidence of a positive impact of foreign aid on growth for the period 1986 to 1992. Their model captured the potential ‘Dutch-Disease’ effect of foreign aid. Hansen and Tarp (2000) provide strong support for other studies that have found aid to have led to increases in aggregate savings, investment, and have a positive effect on the growth. Similarly, Durberry, Gemmell and Greenaway (1998) using an augmented Easterly-Fisher model and employing cross-section and panel data techniques, confirmed this result for a sample of sixty-eight developing countries spanning Latin America, the Caribbean and Sub-Saharan African between 1970 and 1993. Doucouliagos and Paldam (2009) from a meta-analysis of sixty-eight papers that present results showing that aid has a positive yet insignificant impact on economic growth.

The hypothesis that aid effectiveness depends on quality of institutions has some support in the empirical literature available especially by World Bank scholars. One prominent study that tests the aid-growth-policy relationship was Burnside and Dollar (1997). Burnside and Dollar (1997) use a model incorporating a variety of policy variables. They found that the impact of aid on growth becomes positively significant when an interactive variable (aid\* policy) is included in the regression model.

Not all studies however provide full support for this aid-growth-policy view. Ram (2004) argues that there is insufficient evidence to support the view that aid enhances economic growth and reduces poverty in countries with superior quality economic policies. Easterly, Levine, and Roodman (2004) also failed to find evidence in support of Burnside and Dollar (1997) results and suggest that their model results do not hold up to robustness checks. In an attempt to dispute their critiques, Burnside and Dollar (2000, 2004) revisited the foreign aid-led growth link. They provided employed a new data set, case studies and opinion polls but failed to find support for the assumption that aid has the same positive effect in all cases regardless of institutional quality.

Another subset of academics supporting the view that aid leads to growth, provide some evidence that aid effectiveness is conditional on existing political conditions. This can either be the type, quality or stability of the regime.

Boone (1995) analyses the effectiveness of foreign aid programs in ninety-seven aid recipient countries under different political regimes. Boone (1995) finds that in elitist governments, aid does not effectively boost investment, growth, or reduce poverty. Isham, Kaufmann, and Pritchett (1995) concluded that the returns of World Bank funded projects are higher in countries with stronger constitutional and human rights and Boycko et al. (1996) reveal that foreign assistance is counterproductive in countries characterized by a divided government.

Collier and Hoeffler (2002) examine the link between the impact of aid and absorptive capacity for aid in twenty-seven countries emerging from conflicts and conclude that even though countries experience diminishing returns to aid inflows, absorptive capacity depends on the level of policy and quality institutions as rated by the World Bank.

Academics who believe that aid has a limiting effect on growth have suggested varying explanations why aid can be detrimental to economic growth. One line of argument is that aid is substituting instead of complimenting domestic resources and in the long run, causes governments to relax in their tax raising efforts, creates a culture of dependency, distorts equitable distribution of domestic wealth, and promotes corruption and inefficiency in governments in developing countries (Griffin, 1970; Griffin and Enos, 1970; Levy, 1988; Easterly, 1999; Gupta et. al., 2004).

Another reason for the negative impact of foreign aid on economic growth within the existing literature is the 'Dutch Disease' phenomenon (van Wijnbergen, 1984; Rajan and Subramanian, 2005). Voivodas (1973) reported an insignificant negative impact of aid on economic growth for a dataset sample of twenty-two LDCs between 1956 and 1968. Several studies including Mosley et al (1987), Ovaska (2003), Brautigam and Knack (2004) also present results showing that foreign aid has a negative impact on economic growth.

Contrary to Burnside and Dollar (2000), Ovaska (2003) , Djankov, Montalvo, and Reynal-Querol (2005), Doucouliagos and Paldam (2006) failed to find evidence in support of the view that foreign aid given to countries with good quality institutions and uncorrupted regimes boosts the efficiency of aid. The results of Knack (2000) show a significant correlating relationship between aid and worsening political risk. Harford and Klein (2005) concluded that some aid revenue disappears before the anticipated recipients can account for them.

Some analysts such as Jeffrey Sachs, Joseph Stiglitz, Nicholas Stern suggest that the negative effect foreign aid has on economic growth in some instances is as a result of donor conditionalities. They



argue that poor coordination among donors inadequate monitoring and evaluation structure undermine the effectiveness of donor projects and programs. Morss (1984) explained that aid causes government officials to succumb to "pleasing donors" rather than pursuing the development goals of their countries. Svensson (2000), Vreeland (2003) Bird, Hussain, and Joyce (2004), suggest that the poor aggregate record of past aid pay-outs, is the structural reforms usually requested by donors, for example, the International Monetary Fund.

Aid volatility has negative consequences on economic growth. Bulir & Hamann (2003, 2005) show that aid is more volatile than other macroeconomic variables. The results of studies such as Lensink and Morrissey (2000) , Pallage and Robe (2001) reveal that foreign aid is a significant source of income in developing countries and its high volatility has a negative impact on growth in developing countries. Lensink and Morrissey (2000), Chauvet and Guillaumont (2008) and Van Wijnbergen (2009) present similar results.

Some studies, for instance, Dalgaard and Hansen (2000), Reddy and Minoiu (2006) have found evidence of decreasing returns to aid. The main theme among these studies in this group is that there is an optimal level of aid a country can absorb above which there would be diminishing returns.

Lensink and White (1999,2001) estimate an endogenous growth model using cross-country regressions and showed that negative returns to 'high aid', defined as , " aid in excess of 30% of GNP", confirming the existence of an 'aid Laffer curve'. Reynal-Querol (2008) find that the 'aid curse' is a greater than the 'oil curse' especially in cases where the percentage of government revenues as a share of foreign aid is very large.

You have seen that there are varying findings and explanations for the impact of foreign aid on economic growth in recipient economies. Some economists have pointed out that one of the reasons for the varying findings lies in the issue of transmission channels included in the model being estimated. Such channels include through the political regime (Barro, 1990); fiscal policy, Bacha (1990); investment, Gomanee, Girma and Morrissey (2005). Morrissey (2001) highlighted investment in human and physical capital; capacity to import capital goods or technology; investment or savings rates; and technology transfer as mechanisms through which aid can stimulate economic growth.

It is very interesting that most studies evaluating the aid-led growth hypothesis do not entirely focus on Sub-Saharan Africa, whose low levels of development and economic growth in spite of the large aid flows to the region, is one of the main stimulators for the 'Does aid work' debate. As with studies already reviewed, the results of findings with a large portion of their dataset made up of countries from Sub-Saharan Africa are not unanimous and some studies provide evidence in support of the various views (positive effect, negative effect, conditional on institutions, etc.) in the literature already discussed.

There are few African based studies, reaching varying conclusions. Levy (1988) , Gomanee et al (2005), Ekanayake , Bethune-Cookman and Dasha Chatrnas(2010) present evidence that foreign aid has contributed positively to growth in Sub-Saharan African countries by funding public investment. Elbadawi (1999) explained that in Sub-Saharan Africa foreign aid inflows dampen growth of exports and thus economic growth. M'Amanja and Morrissey(2006)using time series data and a multivariate approach to analyse the impact of foreign aid, investment and international trade on economic growth show that aid has a significant negative effect on long run growth.

The results of the Granger causality studies also yield conflicting results. Dhakal et al. (1996) involving four Asian and four African countries using data from 1960 to 1990, did not find any causal relationship between foreign aid and growth in any of these countries. Mallik (2008) investigated the effectiveness of foreign aid for economic growth in the six poorest and highly aid dependent African countries: the Central African Republic, Malawi, Mali, Niger, Sierra Leone and Togo. Using cointegration analysis, a long run relationship was found to exist between GDP, aid, investment and openness. However, in the short run, aid inflows had no significant impact on economic growth except for Niger and the long run effect of aid on growth was found to be negative for five of the countries studied.

Doucouliaqos and Paldam (2006) also pointed out that much of the variation between studies can be attributed to data and specification differences and that journal and institutional affiliation also can influence reported results. A huge number of these studies use regression analysis to investigate the impact of aid on economic growth and rely on an interaction term to ascertain the impact of aid on growth and poverty reduction. If the coefficient of the interactive variable turned up with right sign and a significant t-ratio, they conclude that the aid component did contribute to the effect on the dependent variable that the coefficient implied, for example, Burnside and Dollar (2000).

It has also emerged in the literature that estimating the impact that aid has on growth is complicated by the endogeneity of foreign aid to aid recipient countries' GDP growth. Mosley (1980) suggests the use of instrumental variables to generate exogenous variation in per capita GDP of countries as a solution to the endogeneity problem. Easterly (2005), Boone (1994, 1996) provides support for Mosley (1980) suggestion by also using donor interest rates as 'instruments'.

With all these varying results and economic differences, some researchers believe that causality and cointegration are sensible starting points in testing the aid-led growth hypothesis as direction of causality and long run relationship influences policy choices. Studies such as those by Kenny and Williams (2001) and Hoeffler (2002) have highlighted the fact that cross-country studies do not provide information specific to a particular country and thus it is difficult to come up with country-specific policy implications. In addition with no consensus on the impact of aid on growth, country – specific studies are needed to understand the areas of concern in individual countries. It is clearly noticeable from the review of the literature so far that Africa, especially West Africa is under researched when it come to the issue of aid leading to growth. West Africa, a region rich in natural resources but with countries dependent on aid does not have one comprehensive study investigating the aid-led growth hypothesis in the region.

The main objective of this study is to examine whether there is a positive impact of foreign aid on economic growth in West Africa.

This study aims to answer the following question:

- a) In how many West African countries do long run relationships between foreign aid and economic growth exist?
- b) What is the direction of causality between foreign aid and economic growth in those West African countries where aid and growth are related?
- c) What is the impact of aid on economic growth in the countries where aid is found to lead to economic growth?

### 3.1 THEORETICAL FRAMEWORK

The prototype models used in estimating the effect of foreign aid on economic growth are the Harrod- Domar model and the Chenery and Strout two-gap model (Harrod, 1939; Domar, 1946; Chenery and Strout, 1966). According to these models, the causal relationship between foreign and economic growth runs from aid to growth through savings and investment (Easterly, 1997; Hansen and Tarp, 2000).

This is the central motivation for the first part of the empirical analysis. According to Granger (1988), co integration implies Granger-causality in at least one direction. On this basis, this study would as a first stage carry out cointegration analysis of the aid- growth relationship in West Africa and then Granger-causality as a second stage, to see whether aid inflows lead to growth or vice versa. The third stage would be linear regression analysis to estimate the impact of foreign aid on growth.

During the first step of the empirical analysis, we will use co integration techniques, the Engle-Granger test developed by Engle and Granger (1987), the Error Correction Model method and the Johansen Cointegration test. Cointegration allows us to avoid problems of heteroscedaticity and endogeneity. All three tests are used to capture the specific advantages of each.

In the Engle-Granger test, the following equation would be estimated:

$$GDP_t = C_1 + \alpha_t + \beta_1 FAID_t + \varepsilon_t, \quad t=1,2,\dots, \quad (1)$$

Where :  $GDP_t$  is log GDP at time  $t$ ,  $FAID_t$  is foreign aid as a fraction of GDP,  $C_1$  is the constant term;  $\alpha_t$  is a linear trend  $t$  with coefficient  $\alpha$ ;  $\beta_1$  is the long run coefficient and  $\varepsilon_t$  is the error term;

The Error Correction Method is rooted in a conditional error correction model. The equation estimated would be:

$$\Delta GDP_t = C_2 + \alpha_{2t} + \beta_2 GDP_{t-1} + \beta_3 FAID_{t-1} + \sum_{i=1}^k \eta_i \Delta GDP_{t-i} + \sum_{i=0}^k \gamma_i \Delta FAID_{t-i} + \varepsilon_{3t} \quad (2)$$

Where:  $C_2$  is the constant,  $\alpha_{2t}$  is the linear trend,  $k$  is the appropriate lag length;

And using the Johansen Method a Vector Autoregressive (VAR) equation to be estimated is:

$$\Delta y_t = \sum_{i=1}^{k-1} \theta_i \Delta y_{t-i} + \alpha \beta_4 y_{t-1} + \varphi D_t + \varepsilon_{4t} \quad (3)$$

Where:  $y_t$  is a vector ( $GDP_t, FAID_t$ );  $\beta_4$  represents co integrating vectors among the variables in  $y_t$ ,  $\alpha$  is a vector with rows representing error correction coefficients;  $\theta_i$  is a matrix of short run coefficients;  $\varphi$  represents a matrix of coefficients on  $D_t$  and  $D_t$  is a vector of deterministic terms (constant, trend).

Building on Chenery and Strout (1966) two-gap model, in a bid to investigate whether aid can fill the savings and foreign exchange gap through investment, this study would test the impact of aid on growth on economic growth in those countries where aid has been shown to granger-cause growth .

For the purposes of this study, the key variables included are  $Y$  which is real GDP,  $LAB$  is labour,  $CAP$  is stock of domestic capital,  $FAID$  is foreign aid and  $FDI$  is foreign direct investment. Other usually included control variables such as domestic research and development (R&D) and human capital are not included because of the nature of foreign aid that West African countries receive and lack of data detailing educational attainment which is often used to measure human capital. Most of the aid flows to West Africa are in the form of institutional reform projects and technical assistance. Most of the aid until in recent times with the rise of Chinese aid does not come with any technological transfers that warrant significant research, development and technological efforts on the part of the recipients as foreign direct investment does.

### 3.2 DATA AND VARIABLES

The International Monetary Fund's International Financial Statistics most recent edition and African Development Indicators from the Economic and Social Data Service database are the key sources of the annual time series data employed in the empirical analysis. The sixteen countries in West Africa make up the sample. This sample is pertinent to the foreign-aid led growth in developing countries debate as no study in our opinion has used a complete up-to-date West African sample in regards to this debate especially with the huge amounts of aid that has been poured into this region and the efforts their Governments undertake to meet donor conditionalities. The sample period for each country is reasonably long, twenty-eight years. The only exceptions are Cape Verde and Guinea Bissau with data for only 22 and 25 years respectively.

The variables of interest in the empirical analysis are gross domestic product (GDP) growth which is used as a proxy for economic growth and output; foreign aid in this case, official development assistance (ODA); population used as a proxy for labour supply, domestic savings as a proxy for stock of capital and foreign direct investment. All the variables are in natural logarithmic form in order to remove any heteroscedasticity problem from the model initially and for more realistic comparison expressed as fractions of the GDP in each country.

### 3.3 METHODOLOGY

This study makes use of the Eviews 7<sup>1</sup> econometrics software package to carry out regression analysis and to perform various tests on the equations and models estimated. Cointegration analysis is done for the panel of West African countries and then individually for each country to paint a clearer picture of the causal relationship between aid and growth in each country especially for policy making purposes as the transmission channel varies from country to country. Using both panel and individual time-series increases the possibility of this study providing more accurate estimates of the aid-growth relationship than using time-series estimation alone.

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<sup>1</sup> This econometric software was developed by Quantitative Micro Software in 2008. Their site is: <http://www.eviews.com>.

As a first step, we test for stationarity in the panel data so that the times series behaviour of the individual variables are well approximated and to determine the order of integration of the variables. The Augmented Dickey-Fuller (ADF) test is done for the whole panel, then for the individual countries test to check whether the variables have a unit root. Since the use of panel data increases the predictive power of tests, the Im, Pesaran, and Shin (1997) test for integration is done to confirm the results of the ADF panel unit root test whilst the Phillips- Perron (1988) test is done for the individual countries.

In testing for stationarity, graphs of the time series are first examined to determine whether the test should be done with an intercept, trend or with both. The variables under review must be integrated of order 1,  $I(1)$ , a necessary condition for further testing for two of the tests conducted. If the variables are integrated of different orders; one might conclude that they are not co-integrated. Once the order of integration has been determined, the first test, the Engle-Granger test is carried out for individual countries whilst the Pedroni Residual cointegration was used instead for the panel.

The Engle-Granger test imposes a common factor restriction on the dynamics of the relationships between the variables being tested for a co-integrating relationship, there is a loss of predictive power compared to other cointegration techniques. Therefore, this study also uses the Error Correction Model (ECM) method. One major advantage of this method is that it enables one to analyse both the short-run and long-run effects of the variables as well as the adjustment coefficient. In the Error Correction Method (ECM) Eq. (2) would be estimated.

Pesaran and Shin (1999) suggested using a maximum of two lags as the appropriate lag length. The variables with the lowest t-statistics were gradually dropped from the short-run dynamics of Eq. (2). The presence of cointegration is indicated by a negative significant coefficient on the lagged dependent variable. If statistically significant, the lagged variable is important in predicting current movement of the dependent variable. The important term here therefore is the coefficient of the lagged GDP.

Even though the ECM method has some advantages over the Engle-Granger technique, it has its own shortfalls. Hendry (1987) explained that in the ECM, assumptions of exogeneity are made implicitly about the independent variables. This problem was corrected by Johansen (1988). Unlike the previous tests, the Johansen framework allows the inclusion of variables integrated of order 0,  $I(0)$ . Therefore, using the Johansen Method a Vector Autoregressive (VAR) Equation (3) is estimated.

Thus the VAR model, Eq. (3) would be estimated starting with a large number of lags and then reduced gradually to a parsimonious model with Gaussian error terms. The Pantula method is used to determine the appropriate component of the vector  $D_t$  to be included in the equation being estimated. From Monte Carlo experiments comparing the trace statistics and Eigen value from the Johansen cointegration some researchers, including Toda (1994) and Lütkepohl (2000), show that even though trace tests seem to have distorted sizes, their power is superior. This study will therefore use trace statistics to conduct inference from the results of the Johansen cointegration test.

In countries where there is evidence of cointegration between foreign aid and economic growth, we proceed to test for causality. In the cases where no co integrating relationship is found, no further testing will be done. The Granger causality test is first carried out for the whole panel. However because of the possibility of the assumption of causal homogeneity in the panel, pair-wise granger causality is also done individually for each country.

In countries where both a co-integrating relationship between aid and growth is found as well as unidirectional causality running from aid to growth, we estimate the impact such inflows has on economic growth. We therefore estimate the impact of aid in these countries using a simplified variation of the Chenery and Strout Two-Gap Model.

Taking logs and differencing, we get Eq. 4.1. The individual variables are now growth rates.

$$GDP = \alpha_{3t} + \beta_5 lab + \beta_6 sav + \beta_7 faid + \beta_8 fdi \quad (4.1)$$

Given that foreign direct investment is an important transmission channel for the growth enhancing effect of aid, foreign direct investment as a fraction of GDP is included in the model. Collier and Hoeffler (2002) found the possibility of diminishing returns to aid due to certain countries being constrained by their absorptive capability, initial level of development and economic situation. To capture these characteristics, squared aid as a fraction of GDP, initial GDP at a chosen base year and inflation are included in the model. Squared aid is also to more robust estimates than the (aid\*policy) interactive term. This is based on the ‘The Medicine Model’ explained in Jensen and Paldam (2006).

The final model estimated is therefore,

$$GDP_{it} = \alpha_{3t} + \beta_5 lab_{it} + \beta_6 sav_{it} + \beta_7 faid_{it} + \beta_8 faid_{it}^2 + \beta_9 GDP_{i0} + \beta_{10} fdi_{it} + \beta_{11} inf_{it} + \varepsilon_{7t} \quad (4.2)$$

As previously explained, before estimation, all variables are tested for unit roots. A general model with four lags of each variable is first estimated and then gradually reduced to a parsimonious model. All models are subjected to diagnostic checks: autocorrelation, heteroscedasticity, specification errors and normality of residuals.

#### 4.1 PANEL ESTIMATION RESULTS

First the whole panel of sixteen West African countries was tested for the presence of unit roots. The Augmented Dickey-Fuller –Fisher Chi-square test showed that both foreign aid ( $FAID_t$ ) and economic growth proxied by the gross domestic product ( $GDP_t$ ) are non-stationary at levels but become stationary when they are differenced. Thus both ( $FAID_t$ ) and ( $GDP_t$ ) are stationary at first difference,  $I(1)$ . The results of the ADF-Fisher Chi-square test are confirmed by the Im, Pesaran and Shin test.

**Table One: Results of Panel Unit root Tests**

Variables	ADF - Fisher Chi-square Test Statistic	*Probabilities of ADF-Fisher Test	Order of Integration	Im, Pesaran and Shin T-bar statistic	**T-bar critical values	Order of Integration
$FAID_t$	1432.91	0.0000	I(1)	-9.03675	-1.89000	I(1)
$GDP_t$	438.774	0.0000	I(1)	-6.08504	-1.89000	I(1)
* Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution						
** Critical values of Im, Pesaran and Shin T-bar statistic are from the original paper						

The main objective of this piece of research is to determine whether foreign aid leads to economic growth. The presence of cointegration shows the existence of a long run relationship between the variables under review.

**Table Two: Results of the Panel Cointegration Tests**

Variables	Pendroni Residual Cointegration Test			Error Correction Model			Johansen Fisher Panel Cointegration Test		
	Panel ADF-Statistic	Prob.	Reject Null? Y/N	ECM-Statistic	5% critical Value	Reject Null? Y/N	Fisher Stat.* (from trace test)	**Prob.	Reject Null? Y/N
$FAID_t$ and $GDP_t$ for the whole panel	-23.34344	0.0000	Y	-0.628150	0.04897	Y	70.14	0.0001	Y
**Probabilities of the Johansen Fisher test are computed using asymptotic Chi-square distribution.									

From the results presented in Table Two, the panel ADF-statistic from the Pendroni residual test and the Fisher trace statistic from the Johansen Fisher panel cointegration test statistic are significant at the 5% level. The coefficient of lagged  $GDP_t$  is negative and significant at the 5% level. Therefore, all three panel cointegration tests reject the null hypothesis of no cointegration, providing evidence in support of the belief that aid and GDP are co-integrated for the whole panel. There is evidence of a long run relationship between foreign aid and GDP growth, we therefore proceed to test for causality and the result is presented in Table Three.

**Table Three: Results of the Panel Granger Causality Test**

	Null Hypothesis	F-Statistic	Probability	Conclusion
Panel	$GDP_t$ does not Granger cause $FAID_t$	0.32094	0.5713	$FAID_t$ Granger causes $GDP_t$
	$FAID_t$ does not Granger cause $GDP_t$	8.52862	0.0036	

The results of the Panel Granger causality test provide support for the hypothesis that foreign aid leads to economic growth. There is evidence of unidirectional causality running from foreign aid to economic growth at the 5% critical level. From the panel data evidence, we can conclude that there is evidence in support of the foreign-aid led growth hypothesis in West Africa.

Even though the results from the panel cointegration and Granger-causality test affirm that foreign aid leads to economic growth, it is not farfetched for one to account for this aid-growth relationship in the individual countries especially for policy making purposes.

## 4.2 COUNTRY SPECIFIC TIME SERIES ESTIMATION RESULTS

As with the panel data analysis, we start the individual country time series analysis by assessing the unit root properties of both foreign aid and GDP growth for each West African country. Using the

Augmented Dickey-Fuller unit root test, foreign aid was found to be non-stationary at levels but stationary at first differences, therefore  $I(1)$  for all the countries in the sample. GDP exhibited similar unit root properties for all countries. These results were reiterated by the results of the Phillips-Peron test. The results of both tests are presented in the Appendix.

Cointegration tests were carried out between foreign aid and GDP growth for each country. A combination of the Engle-Granger two-step procedure, an Error correction model and the Johansen system cointegration tests were used. With the explained advantages and shortfalls of each test, as explained in the methodology, one did not expect all three tests to reach the same conclusion for each country. As shown in the results presented in Table Four this was not the case.

**Table Four: Results of Cointegration Tests: Engle-Granger, Error Correction Model and Johansen cointegration tests**

Country	Engle-Granger Test			Error Correction Model			Johansen Test		
	tau-Statistic	Prob*	Reject Null? Y/N	ECM-Statistic	5% critical Value	Reject Null? Y/N	$\lambda$ -Trace Statistic	P values	Reject Null? Y/N
Benin	-7.206628* -4.430051**	0.0000 0.0009	Y	-0.004303	0.00869	Y	38.32137	0.0009	Y
Burkina Faso	-4.754125* -4.631329**	0.0025 0.0034	Y	-0.006492	0.01059	Y	26.60958	0.0404	Y
Cote D'Ivoire	-8.702792* -4.131613**	0.0000 0.0121	Y	-0.390437	0.21051	N	31.96385	0.0077	Y
Cape Verde	0.0121* -4.281639**	0.0000 0.0084	Y	-0.009386	0.01547	Y	5.019221	0.8068	N
Gambia	-6.094518* -4.528059**	0.0001 0.0045	Y	0.201331	0.05432	N	33.99108	0.0004	Y
Ghana	-8.555015* -2.389478**	0.0000 0.1245	N	-0.012806	0.00332	Y	29.28788	0.0180	Y
Guinea	-7.096108* -6.762542**	0.0000 0.0000	Y	-0.002052	0.00142	Y	39.97839	0.0005	Y
Guinea-Bissau	-9.953437* -3.668798**	0.0000 0.0352	Y	-0.02214	0.09368	N	32.44807	0.0066	Y
Liberia	-6.338455* -4.135657**	0.0000 0.0119	Y	-0.308020	0.25490	N	38.59762	0.0008	Y
Mali	-4.651981* -4.202324**	0.0033 0.0102	Y	-0.489453	0.19727	N	41.27748	0.0003	Y
Mauritania	-4.306956* -5.341221**	0.0080 0.0005	Y	-0.421043	0.23913	N	30.93237	0.0107	Y
Niger	-6.917723* -3.932935**	0.0000 0.0193	Y	-0.489453	0.02163	N	42.57110	0.0000	Y
Nigeria	-4.551558* -4.505789**	0.0042 0.0048	Y	-0.029396	0.00786	Y	17.25684	0.1232	N
Senegal	-9.656782* -5.045829**	0.0000 0.0012	Y	-0.012991	0.00570	Y	13.28154	0.1049	N
Sierra Leone	-5.997020* -5.638873**	0.0001 0.0002	Y	-0.457532	(0.17743)	N	9.075281	0.3585	N
Togo	-7.222273* -4.657908**	0.0000 0.0032	Y	-0.035970	0.00862	Y	8.481979	0.4154	N
*: from residuals of $FAID_t$ from Engle-Granger Test; **: from residuals of $GDP_t$ from Engle-Granger Test									
^In the ECM, the presence of cointegration is indicated by a negative significant coefficient on the lagged dependent ( $GDP_t$ ) variable.									
^^ The critical values for the Johansen test are MacKinnon-Haug- Michelis (1999) $p$ -values.									



From the Engle-Granger test, the t-statistic rejects the null of no cointegration at the 5% conventional level for all the countries except Ghana. In the ECM, cointegration is showed by the negative coefficient of lagged GDP, significant at the conventional 5% level. The null of no cointegration was rejected for Benin, Burkina Faso, Cape Verde, Ghana, Guinea, Nigeria, Senegal and Togo. For all the other countries, the ECM failed to detect cointegration and this might be due to the foreign aid- GDP ratio. From the trace-statistic of the Johansen test, we failed to reject the null hypothesis of no cointegration in the cases of Cape Verde, Nigeria, Senegal, Sierra Leone and Togo. In all the sixteen countries, at least one test confirmed a co-integrating relationship between foreign aid and GDP growth. Since according to Granger (1988), cointegration implies Granger-causality in at least one direction, we proceed to test the validity of this implication in West Africa. The Granger causality test was carried out for all the sixteen countries and the pair-wise results are presented in Table five

**Table Five: Results of Pair wise Granger causality Test for Individual Countries**

Country	Null Hypothesis	F-Statistic	Probability	Conclusion
Benin	$GDP_t$ does not Granger cause $FAID_t$	0.22254	0.6401	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	3.12320	0.0862	
Burkina Faso	$GDP_t$ does not Granger cause $FAID_t$	0.00650	0.9362	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	0.56502	0.4574	
Cote d'Ivoire	$GDP_t$ does not Granger cause $FAID_t$	0.67779	0.4161	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	1.43638	0.2390	
Cape Verde	$GDP_t$ does not Granger cause $FAID_t$	1.04560	0.3137	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	0.79070	0.3801	
Gambia	$GDP_t$ does not Granger cause $FAID_t$	2.53190	0.1208	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	1.66111	0.2062	
Ghana	$GDP_t$ does not Granger cause $FAID_t$	0.34666	0.5601	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	0.71334	0.4046	
Guinea	$GDP_t$ does not Granger cause $FAID_t$	0.32391	0.5730	$FAID_t$ Granger causes $GDP_t$
	$FAID_t$ does not Granger cause $GDP_t$	11.2511	0.0020	
Guinea-Bissau	$GDP_t$ does not Granger cause $FAID_t$	0.03837	0.8459	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	0.50329	0.4829	
Liberia	$GDP_t$ does not Granger cause $FAID_t$	4.36672	0.0442	$GDP_t$ Granger causes $FAID_t$
	$FAID_t$ does not Granger cause $GDP_t$	0.38690	0.5381	
Mali	$GDP_t$ does not Granger cause $FAID_t$	0.03546	0.8518	$FAID_t$ Granger causes $GDP_t$
	$FAID_t$ does not Granger cause $GDP_t$	5.41162	0.0261	
Mauritania	$GDP_t$ does not Granger cause $FAID_t$	0.00907	0.9247	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	0.00012	0.9913	
Niger	$GDP_t$ does not Granger cause $FAID_t$	1.67826	0.2039	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	1.41334	0.2427	
Nigeria	$GDP_t$ does not Granger cause $FAID_t$	4.84580	0.0346	$GDP_t$ Granger causes $FAID_t$
	$FAID_t$ does not Granger cause $GDP_t$	1.57406	0.2182	
Senegal	$GDP_t$ does not Granger cause $FAID_t$	0.47962	0.4933	$FAID_t$ Granger causes $GDP_t$
	$FAID_t$ does not Granger cause $GDP_t$	3.87920	0.0571	
Sierra Leone	$GDP_t$ does not Granger cause $FAID_t$	2.1E-05	0.9963	$GDP_t$ and $FAID_t$ are independent
	$FAID_t$ does not Granger cause $GDP_t$	0.12145	0.7296	
Togo	$GDP_t$ does not Granger cause $FAID_t$	9.89809	0.0034	$GDP_t$ Granger causes $FAID_t$
	$FAID_t$ does not Granger cause $GDP_t$	1.33503	0.2560	

We assume that five years is a reasonable long enough time for the effects of foreign aid inflows to adequately predict economic growth. From the results in Table Seven, foreign aid was found to granger cause GDP growth in only Guinea, Mali and Senegal. Unidirectional causality from GDP growth to foreign aid was evident in Liberia, Nigeria and Togo. Aid and GDP growth were independent in the remaining countries. The finding that foreign aid and growth are independent in most of the countries in the sample is not an outlier in the empirical evidence available. For example, using Granger causality tests, Dhakal et al (1996) using a data set including four African countries

(Botswana, Kenya, Malawi and Tanzania), and data from 1960 to 1990, did not find any causal relationship between foreign aid and growth in any of these countries.

The high number of countries in which aid and GDP growth are found to be independent was not expected given the high volume of aid that the region has received over the years. This implies that there are several underlying factors affecting the impact of aid on growth in these countries. We cannot specifically pinpoint the reason in each country. In the literature however, common reasons why aid does not cause growth in most countries include corruption (Transparency Paper, 2008). Corruption leads to misappropriation of funds and lack of monitoring. Morss (1984) explained some government officials succumb to "pleasing donors" rather than pursuing the development goals of their countries especially in cases where aid inflows are as vital sources of revenue. There is also evidence that some IMF conditionalities are detrimental to growth and often to in line with the development goals of the recipient government especially those implementing Poverty Reduction Strategy Paper (Vreeland, 2003).

Since foreign aid granger-causes GDP growth in Guinea, Mali and Senegal, we proceed to estimate the impact aid has on economic growth in these countries by estimating a variation of the Cobb-Douglas production function. i.e. Equation (4.1). As usual, stationarity tests were done for the other explanatory variables included in the model being estimated. In the case of Guinea, savings, population growth (proxy for labour due to lack of sufficient labour statistics for the sample), foreign direct investment, inflation, constant GDP at base year 2000 and absorptive capacity (proxied by aid<sup>2</sup>) are all stationary at first differences.

For Mali, savings, population growth, foreign direct investment, constant GDP at base year 2000 and absorptive capacity are integrated of order one whilst inflation is stationary at levels. From the evaluation of the time series for Senegal, savings, population growth, foreign direct investment, and constant GDP at base year 2000 are integrated of order one whilst inflation and absorptive capacity are stationary at levels.

A general model with three lags of each stationary variable and a constant was first estimated and gradually reduced to a parsimonious model. The choice of three lags of each variable was due to the fact that for any number of lags higher than three, we would have insufficient observations to carry out the regression analysis. Variables with the lowest t-statistic values were gradually removed from the specification and both the Schwarz criterion and F-statistic were used to check the legitimacy of the variable reduction. Before reaching the final parsimonious model estimated, each reduction had a lower SIC value than the proceeding specification. To ensure that the model estimated was correctly specified, diagnostics were carried out on both the residuals and the whole model. Tests were carried out to check for the normality of the residuals, autocorrelation, heteroscedasticity, omitted variables, specification errors and the general stability of the model. The results of the estimation are shown in Table Six.

From economic theory, the independent variables in relation to the dependent variable are expected to have the signs depicted in Table Seven. We now provide some intuition behind the expected signs of the other explanatory variables included in the linear model being estimated.

**Table Six: Expected Signs of Variables**

Variables	Expected Sign
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Savings	+
Foreign Aid	+/-
Labour	+/-
Inflation	+/-
Foreign Direct Investment	+/-
GDP at constant 2000 prices	undetermined
Absorptive Capability	+/-

Savings is expected to have a positive impact on economic growth. Support for this intuition can be seen in Lewis's (1955) traditional development theory which showed that increasing savings would accelerate growth. The Chenery and Strout two-gap model showed that countries face a 'savings gap' and a 'foreign exchange gap'. Filling the 'savings gap' would lead to growth.

Foreign Aid can either have a positive or negative impact on economic growth. The evidence from the empirical literature shows that aid's impact on growth depends on several underlying factors. These include among others, the component of the aid flows (Reddy and Minoiu, 2006); Quality of policies (Burnside and Dollar, 1997); Quality of Institutions (Svensson, 2000); 'Dutch Disease', Donor conditionalities and aid fungibility.

The Absorptive Capability of the economy can have either a positive or negative impact on growth. The main reason is that absorptive capacity depends on, political stability (Collier and Hoeffler, 2002), the quality of policy and institutions. Stability, good policies and institutions, increase the absorptive capability of an economy resulting in faster transmission of the growth effects of inflows (aid or FDI).

GDP at constant prices can be used to capture the endogeneity effect of foreign aid to aid recipient countries' GDP growth (Mosley, 1980; Easterly, 2005; Dalgaard, Hansen and Tarp, 2004). It can also be used as a proxy for 'initial endowment' (Tsangaris's, 2005). Since initial endowments, growth policies and transmission mechanisms vary from country to country, the expected impact on growth a priori is undetermined.

The impact of foreign direct investment on growth can either be positive or negative. There is no general consensus in the empirical literature with regard to its impact on growth. From the Chenery and Strout two-gap model, it is presumed that the 'foreign exchange gap' that capital from aid, through investment can lead to growth. It is evident though that FDI's impact on growth is contingent on many factors including: transmission path, openness (Bhagwati, 1978; de Mello, 1996), pre-existing development threshold (Borensztein et al. 1995); absorptive capability, (Durham, 2004).

Even early growth models could not agree on the impact of inflation on economic growth. The aggregate supply-aggregate demand (AS-AD) framework hypothesized a positive relationship between inflation and growth. Studies like Mundell (1963), Barro (1990) demonstrate that an increase in inflation or inflation expectations immediately reduces people's wealth leading to a negative effect on growth. Therefore the impact of inflation on economic growth depends on the trade-off between growth and inflation that the economy can achieve.

Population growth for the purposes of this study represents labour. Its impact on growth can be either negative or positive depending on competition for resources (Malthus, 1992), productivity (Gorg and Greenway, 2004), quality of human capital and fraction of the population that is economically active.

Now that we have established the expected signs of the variables influencing GDP growth, we proceed to interpret the regression results presented in Table Seven. The impact of foreign aid and other explanatory variables on economic growth differs from country to country.

In Guinea, even though we had found that foreign aid granger causes GDP growth, the regression analysis shows that lagged aid has a negative impact on Guinea's economic growth contrary to the positive significant impact of FDI, suggesting that the effects of aid flows take quite a long time to contribute positively to growth. The initial capital endowment significantly contributes to growth. One can conclude that the population of Guinea contributes productively towards growth and the country's absorptive capacity is high. However, Inflation is found to be harmful for Guinean growth. The Ramsey RESET test shows the correct model was specified and estimated. It explained 53% of the variation in Guinea's GDP growth.

**Table Seven: OLS estimates from Multiple Linear Regression Model**

Guinea	
$GDP_t = 85.81368 + 1107.426 lab_{t-1} - 314.0844 FAID_{t-1}$ (0.0192) (0.0012) (0.0000) $+ 13.16625 (FAID)_{t-1}^2 + 32696.12 GDP_{i0} + 189.6781 FDI$ (0.0000) (0.0000) (0.0035) $- 16.51932 INF_{t-1}$ (0.0000)	$\bar{R}^2$ : 0.533469 D W: 2.103416 F-statistic: 39.97391; (0.000000)* Jarque-Bera: 1.446285; (0.485225)* B-P-G test: 0.925904; (0.4672)* RESET: 17.42339; (0.0008)*
Mali	
$GDP_t = +1559.727 lab_{t-1} + 1.559647 SAV_t$ (0.0001) (0.0004) $+ 11.72059 (FAID)_{t-3} + 0.681462 (FAID)_{t-3}^2$ (0.0000) (0.0000) $+ 1576.548 GDP_{i0} - 7.862067 (FDI)_{t-2} + 2.444011 INF_t$ (0.0000) (0.0000) (0.0000)	$\bar{R}^2$ : 0.499725 D W: 1.669685 F-statistic: 4011.553; (0.000006)* Jarque-Bera: 1.754383; (0.415949)* B-P-G test: 1.028686; (0.4923)* RESET: 48.90005; (0.0198)*
Senegal	
$GDP_t = 73.82806 + 230.6577 lab_t - 7.488563 (SAV)_{t-2}$ (0.0284) (0.0785) (0.0757) $+ 47.91790 (FAID)_{t-1} - 7.434368 INF_t$ (0.1154) (0.0004)	$\bar{R}^2$ : 0.637669 DW: 1.736498 F-statistic: 3.189975; (0.008155)* Jarque-Bera: 0.1484432; (0.911908)* B-P-G test: 0.690173; (0.7709)* RESET: 3.960672; (0.0586)*
<p><b>Durbin Watson (D.W.) statistic:</b> a test statistic used to detect the presence of autocorrelation. <math>D.W = 2</math> indicates no autocorrelation.</p> <p><b>Jarque-Bera statistic:</b> tests whether sample data have the skewness and kurtosis matching a normal distribution.</p> <p><b>Breusch-Pagan-Godfrey test statistic:</b> Ho: no heteroscedasticity.</p> <p><b>Ramsey RESET test:</b> Regression Specification Error Test. Ho: <math>\epsilon \sim N(0, \sigma^2 I)</math>.</p> <p>*Probability values in brackets.</p>	

Foreign aid was found to have a significant positive impact on GDP growth in Mali. This impact is further helped by Mali's significant positive absorptive capability and domestic savings. The population also contributed significantly to Mali's economic growth, suggesting high levels of productivity. In Mali, inflation increases with growth. There is the possibility that through a mix of policies, the trade-off between inflation and growth is being experienced. 49% of the variation in economic growth in Mali is explained by the model estimated.

Similar to the case of Mali, aid impacts positively on economic growth in Senegal. Even though the Senegalese population has a positively impact on GDP growth, they consume more and save less as the economy grows. FDI was insignificant in the economic growth of Senegal so failed to make it to the final model being estimated. The model however explained 63 % of the variation in GDP growth in Senegal.

From the analysis of the results of the Ramsey RESET test, all three models are correctly specified. According to the Jarque-Bera statistic, the residuals of the models estimated for each country have residuals that are normally distributed and homoscedastic. The Durbin-Watson statistic in each case is close to 2, thus we can safely assume negligible autocorrelation.

These findings are similar to Mallik (2008) who investigated the effectiveness of foreign aid for economic growth in the six highly aid dependent African countries: the Central African Republic, Malawi, Mali, Niger, Sierra Leone and Togo. The study found a long run co-integrating relationship between GDP and aid. However aid flows had no significant impact on economic growth in any of the countries studies except for Niger and was found to be negative for five of the countries studied.

We are unable to compare our results with more studies due to the lack of studies with a complete up to date West African dataset using similar methodology. However, given that care has been taken to adhere to all necessary econometric rules applicable to our methodology, we believe that our methodology can be generalised to other African countries and the variation in the country specific findings would be similar.

## **5.1 CONCLUSION**

In this paper, we investigated the foreign-aid led growth hypothesis in West Africa. The main aims of the study were based on four main areas of concern: to determine how many West African countries experience long run relationships between foreign aid and economic growth, the direction of causality between foreign aid and economic growth in these countries, the impact of aid on economic growth in the countries where aid is found to lead to economic growth and compared to more traditional donors like the IMF and World Bank.

Our analysis departed from the previous literature in at least three important ways. Firstly we used a completely West African sample and up to date time series data. Our analysis was not limited to just panel data techniques but also we carried out country-by-country evaluations so as to present results reflecting country specific aid-growth relationships and not the ‘one coat fits all’ conclusion.

Our findings are in line with the general themes that have emerged in the aid-growth literature. The results of the panel cointegration tests reveal that in general, there is a long run co-integrating relationship between aid and economic growth in West Africa. The granger causality test, showing evidence of unidirectional causality running from foreign aid to GDP growth also provides support of the foreign –aid led growth hypothesis in West Africa.

The results of our time series analysis of the aid-growth relationship in the individual West African countries showed that the aid experience varies from country to country. Indeed a co-integrating relationship between foreign aid and economic growth was found in each country by at least one cointegration test. However, the similarities stop there. The granger causality tests reveal that aid and

growth are independent in more West African countries than we expected. Foreign aid was found to granger – cause economic growth in Guinea, Mali and Senegal only. Growth was found to granger-cause aid in Liberia, Nigeria and Togo. In the remaining countries, both variables were independent. This has serious policy implications.

The impact of foreign aid on economic growth could not be more different from the results of the estimation of the modified Cobb-Douglas function for Guinea, Mali and Senegal. Aid had a negative impact on growth in Guinea but the absorptive capacity of the Guinean economy to foreign inflows, either aid or FDI proved to be one of the significant determinants on economic growth in the country. Mali experienced a positive growth impact of aid on growth whilst in Senegal; the impact of aid on growth was so insignificant that aid was dropped from the final parsimonious model estimated. Other economic factors like level of savings, inflation rates, labour productivity, initial level of GDP and foreign direct investment were significant factors that determine the varying economic growth rates experienced by West African countries.

## **5.2 POLICY RECOMMENDATIONS**

West African governments and all other economies must embark on carrying out research on their specific economies. They should avoid implementing policies implemented in other countries without first investigating the similarities and more importantly the differences with their economies. The underlying economic factors and policy dynamics vary from country to country. We believe therefore that all policies must be tailor made. The ‘one cloak fits all’ approach must not be applied in governance or economics.

Transparency is a very important attribute for all aid relationships. Donors and recipient economies must make efforts to better disclose the terms of credit agreements. In some cases even though the terms of agreement have underlying political influences, disclosure to policy drafters can help promote better monitoring of implementation. This increases the chances of preventing exploitation, maintaining quality control and ensuring that the best interests of the recipient economies are been sought.

Governments would be weary of agreements with highly stipulated procurement contracts through which donations would constantly flowing back to donors. More effort should be made in employing local experts and just a few expatriates for guidance purposes only. Many developing countries have undergone several institutional strengthen and capacity building projects funded by the World Bank. It is about time that the strengthened intuitions and augmented capacity be used. This would not only promote labour productivity but also provides the indigenes with hands on experience to manage future aid projects or programs.

Countries needing aid must not ‘sell themselves short’. Aid has increased the potential for donors to buy preferential future treatment for the firms of their own nationality at the expense of domestic firms. They must not give up too much especially when giving mining and tax concessions. More is needed to be done to ensure autonomy in their financial choices and to ensure that donor conditionalities are aligned with national development goals.

Corporate Social Responsibility (CSR) is not well monitored in developing countries. Major efforts are needed to ensure that donors especially foreign firms contract to implement aid projects contribute to society. Contributions towards better infrastructure, health and maintaining a clean environment

not only would lead to growth but would ensure that the gains of such aid projects trickle down to the masses in society.

Finally, developing economies must strive to take their economic destiny into their own hands and gradually cease to be highly dependent on foreign aid. A step in this direction is especially needed with the rise in financial and currency crises in the West. Recently the IMF announced that if the large economies of the euro zone need bailing out, it lacks the necessary funds to do so. This is a bell ringer. Aid, especially from the West should stop being the main source of revenue for developing countries. There are other determinants of growth that effort can be made to promote. Savings, investment, productivity, fiscal discipline and the quality of institutions are keys to speeding up economic growth in these countries.

As the research has shown that aid does not necessarily lead to growth, the above steps and even more proactive economic and social policies are needed for West African countries to gain much needed financial independence and take their development destiny into their own hands.

### **5.3 LIMITATIONS**

All the time series data used in this study are from secondary sources and might be subject to biases and other measurement errors. The time period is limited to 1970 to 2008. Due to lack of data, population was used as a proxy for labour which would have given much more accurate estimates of productivity. This study does not provide country specific explanations for the granger causality results. Analysis of each country's economy would be needed for further analysis; we thus recommend this for future studies.

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## APPENDIX

### Appendix One: Results of the Augmented Dickey-Fuller Unit Root Test

Country	$FAID_t$ Test statistic	5% critical value	Order of Integration	$GDP_t$ ADF Test statistic	5% critical value	Order of Integration
Benin	-8.758383	-1.950117	I(1)	-6.141545	-3.536601	I(1)
Burkina Faso	-4.991342	-1.950117	I(1)	-4.800803	-3.536601	I(1)
Cote D'Ivoire	-8.903093	-1.950117	I(1)	-4.196476	-1.950117	I(1)
Cape Verde	-7.784984	-1.950117	I(1)	-4.232745	-3.536601	I(1)
Gambia	-7.704361	-1.950117	I(1)	-5.965341	-2.943427	I(1)
Ghana	-8.917644	-1.950117	I(1)	-3.562910	-1.950687	I(1)
Guinea	-6.924685	-1.950117	I(1)	-6.700323	-1.950117	I(1)
Guinea-Bissau	-10.04614	-1.950117	I(1)	-3.570999	-1.950117	I(1)
Liberia	-6.542782	-1.950117	I(1)	-3.758308	-1.950117	I(1)
Mali	-6.203324	-1.950394	I(1)	-5.065263	-2.943427	I(1)
Mauritania	-4.561287	-1.950394	I(1)	-5.297282	-2.943427	I(1)
Niger	-7.187685	-1.950394	I(1)	-3.813512	-1.950117	I(1)
Nigeria	-3.604712	-1.950117	I(1)	-3.709980	-2.943427	I(1)
Senegal	-7.090903	-1.950394	I(1)	-5.144489	-2.943427	I(1)
Sierra Leone	-5.307864	-1.950117	I(1)	-5.645953	-1.950117	I(1)
Togo	-7.261451	-1.950117	I(1)	-4.620013	-2.943427	I(1)

### Appendix Two: Results of the Phillips-Peron Unit Root Test

Country	$FAID_t$ PP Test statistic	5% critical value	Order of Integration	$GDP_t$ PP Test statistic	5% critical value	Order of Integration
Benin	-8.649960	-2.943427	I(1)	-6.085497	-2.943427	I(1)
Burkina Faso	-4.951633	-1.950117	I(1)	-4.855291	-2.943427	I(1)
Cote D'Ivoire	-15.34885	-1.950117	I(1)	-4.180412	-2.943427	I(1)
Cape Verde	-8.221225	-1.950117	I(1)	-4.354139	-1.950117	I(1)
Gambia	-7.704361	-1.950117	I(1)	-6.020918	-2.943427	I(1)
Ghana	-9.043675	-1.950117	I(1)	-3.562910	-1.950687	I(1)
Guinea	-6.906724	-1.950117	I(1)	-6.802516	-1.950117	I(1)
Guinea-Bissau	-9.962005	-2.943427	I(1)	-3.719601	-2.943427	I(1)
Liberia	-6.558670	-2.943427	I(1)	-3.734140	-2.943427	I(1)
Mali	-6.089721	-2.943427	I(1)	-5.028151	-2.943427	I(1)
Mauritania	-8.779072	-1.950117	I(1)	-5.320321	-2.943427	I(1)
Niger	-7.038887	-1.950117	I(1)	-3.727855	-2.943427	I(1)
Nigeria	-3.641561	-1.950117	I(1)	-3.728065	-2.943427	I(1)
Senegal	-11.63925	-1.950117	I(1)	-5.153857	-2.943427	I(1)
Sierra Leone	-5.731977	-1.950117	I(1)	-5.629332	-1.950117	I(1)
Togo	-7.748115	-1.950117	I(1)	-4.467060	-1.950117	I(1)